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Supplemental Material

Indoor Wood-Burning Stove and Fireplace Use and Breast Cancer in a Prospective Cohort Study

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Sister Study Baseline Residential Questionnaire

Asked for both current (baseline) residence and longest-held adult residence. Response options noted in parentheses.

1. Is there a fireplace or wood-burning stove inside this residence? (Yes/No)
2. About how many days per year do you use a fireplace and/or wood burning stove at this residence? (X days per year)
3. What kind of fuel do you burn in the fireplace and/or stove? Do you use...
(wood/coal/natural gas or propane/artificial logs (like Duraflame)/other fuel)
4. What is the main source of heat at this residence? Is it... (natural gas/electricity/fuel oil/kerosene/propane/coal/wood/solar/other)
5. What is the energy source for the cooking stove top or range top at this address? Is it...(electricity/gas or natural gas/wood fire coal/propane/other).

Table S1. Indoor wood-burning stove/fireplace use and breast cancer incidence by geographic region, NIEHS Sister Study.

| Indoor wood-burning stove/fireplace use in longest adult residence | Geographic Region | | | | | | | |
|---|-------------------|--------------------------|---------|--------------------------|-------|--------------------------|------|--------------------------|
| | Northeast | | Midwest | | South | | West | |
| | N | HR (95% CI) ¹ | N | HR (95% CI) ¹ | N | HR (95% CI) ¹ | N | HR (95% CI) ¹ |
| Indoor wood-burning stove/fireplace ² | | | | | | | | |
| Never | 156 | 1.00 (referent) | 236 | 1.00 (referent) | 222 | 1.00 (referent) | 104 | 1.00 (referent) |
| Ever | 255 | 1.00 (0.81, 1.24) | 391 | 1.05 (0.88, 1.26) | 447 | 1.11 (0.94, 1.33) | 404 | 1.32 (1.05, 1.66)* |
| Indoor wood-burning stove/fireplace fuel | | | | | | | | |
| No | | | | | | | | |
| stove/fireplace | 156 | 1.00 (referent) | 236 | 1.00 (referent) | 222 | 1.00 (referent) | 104 | 1.00 (referent) |
| Wood | 180 | 1.03 (0.81, 1.30) | 251 | 1.07 (0.88, 1.29) | 244 | 1.03 (0.84, 1.25) | 247 | 1.30 (1.02, 1.67)* |
| Gas | 29 | 0.93 (0.62, 1.42) | 114 | 1.16 (0.91, 1.48) | 119 | 1.15 (0.90, 1.46) | 91 | 1.30 (0.96, 1.76) |
| Artificial logs | 51 | 0.89 (0.64, 1.25) | 72 | 0.80 (0.60, 1.06) | 105 | 0.93 (0.72, 1.19) | 111 | 1.36 (1.02, 1.81)* |

¹adjusted for age, race, education, income, marital status, parity, use of hormonal birth control, use of postmenopausal hormones, age at menopause and menopausal status and BMI

² p for interaction=0.1

* p-value < 0.05

Table S2. Indoor heating/cooking and breast cancer in those whose baseline and longest adult residence are the same, NIEHS Sister Study.

| Indoor air pollution at current adult residence | | Person-years | Overall BC N | Overall BC HR (95% CI) ¹ |
|---|------------------------|--------------|--------------|-------------------------------------|
| Energy source for the cooking stove top | | | | |
| | Electricity | 107,131 | 797 | 1 |
| | Gas | 62,793 | 482 | 1.04 (0.93, 1.17) |
| | Other | 7,967 | 34 | 0.57 (0.40, 0.82)* |
| Main source of heating | | | | |
| | Electricity | 41,442 | 277 | 1 |
| | Gas | 101,694 | 791 | 1.16 (1.00, 1.33)* |
| | Fuel oil | 17,135 | 149 | 1.27 (1.03, 1.57)* |
| | propane | 8,591 | 42 | 0.77 (0.55, 1.07) |
| | Wood | 3,896 | 28 | 1.12 (0.75, 1.67) |
| | Other | 2,961 | 14 | 0.67 (0.37, 1.19) |
| Fireplace/stove | | | | |
| | No stove/fireplace | 61,198 | 414 | 1 |
| | Yes | 116,683 | 899 | 1.10 (0.97, 1.25) |
| Stove/fireplace fuel | | | | |
| | No stove/fireplace | 61,198 | 414 | 1 |
| | Wood | 61,022 | 449 | 1.05 (0.91, 1.22) |
| | Gas | 31,098 | 238 | 1.15 (0.97, 1.37) |
| | Artificial logs | 26,535 | 182 | 0.99 (0.82, 1.19) |
| Frequency | | | | |
| | No stove/fireplace | 61,198 | 414 | 1 |
| | Less than once a month | 37,853 | 278 | 1.04 (0.88, 1.23) |
| | 1-4 times/month | 27,955 | 231 | 1.24 (1.04, 1.47)* |
| | at least once a week | 21,358 | 154 | 1.07 (0.88, 1.30) |

¹ adjusted for age, race, education, income, marital status, parity, use of hormonal birth control, use of postmenopausal hormones, age at menopause and menopausal status and BMI

* p-value < 0.05

Table S3. Indoor heating/cooking at baseline adult residence and breast cancer, NIEHS Sister Study.

| Indoor air pollution at baseline adult residence | Person-years | All breast cancer (N=2,416) | Invasive breast cancer (N=1,843) | DCIS (N=533) | Overall HR (95% CI) ¹ | Invasive HR (95% CI) ¹ | DCIS HR (95% CI) ¹ |
|--|--------------|-----------------------------|----------------------------------|--------------|----------------------------------|-----------------------------------|-------------------------------|
| Indoor wood-burning stove/fireplace | | | | | | | |
| No stove/fireplace | 121,333 | 859 | 650 | 195 | 1 | 1 | 1 |
| Yes | 204,831 | 1557 | 1193 | 338 | 1.05 (0.96, 1.15) | 1.08 (0.97, 1.20) | 0.93 (0.77, 1.13) |
| Indoor wood-burning stove/fireplace fuel | | | | | | | |
| No stove/fireplace | 121,333 | 859 | 650 | 195 | 1 | 1 | 1 |
| Wood | 91,604 | 664 | 517 | 132 | 1.01 (0.91, 1.13) | 1.07 (0.95, 1.22) | 0.78 (0.61, 0.99)* |
| Gas | 67,541 | 497 | 367 | 125 | 1.04 (0.92, 1.18) | 1.04 (0.90, 1.20) | 1.05 (0.82, 1.34) |
| Artificial logs | 47,350 | 330 | 250 | 69 | 0.96 (0.84, 1.10) | 1.00 (0.85, 1.17) | 0.76 (0.56, 1.02) |
| Indoor wood-burning stove/fireplace frequency of use | | | | | | | |
| No stove/fireplace | 121,333 | 859 | 650 | 195 | 1 | 1 | 1 |
| Less than once a month | 64,492 | 475 | 362 | 103 | 1.01 (0.89, 1.14) | 1.05 (0.91, 1.20) | 0.85 (0.65, 1.10) |
| 1-4 times/month | 52,016 | 413 | 304 | 103 | 1.15 (1.01, 1.30)* | 1.14 (0.98, 1.32) | 1.14 (0.88, 1.48) |
| at least once a week | 36,489 | 255 | 201 | 49 | 0.99 (0.86, 1.15) | 1.06 (0.90, 1.25) | 0.78 (0.56, 1.09) |
| Energy source for the cooking stove top | | | | | | | |
| Electricity | 199,165 | 1503 | 1144 | 336 | 1 | 1 | 1 |
| Gas | 111,898 | 832 | 633 | 185 | 0.99 (0.91, 1.08) | 0.99 (0.89, 1.09) | 0.97 (0.80, 1.17) |

| | | | | | | | |
|------------------------|---------|------|------|-----|-------------------|-------------------|--------------------|
| Other | 15,179 | 81 | 66 | 12 | 0.7 (0.56, 0.89)* | 0.77 (0.6, 1.00) | 0.42 (0.23, 0.80)* |
| Main source of heating | | | | | | | |
| Electricity | 88,768 | 634 | 486 | 141 | 1 | 1 | 1 |
| Gas | 181,004 | 1386 | 1049 | 312 | 1.07 (0.97, 1.18) | 1.05 (0.94, 1.17) | 1.1 (0.89, 1.35) |
| Fuel oil | 25,079 | 207 | 155 | 48 | 1.13 (0.96, 1.33) | 1.07 (0.88, 1.29) | 1.27 (0.91, 1.78) |
| Propane | 16,829 | 94 | 76 | 16 | 0.82 (0.65, 1.02) | 0.86 (0.68, 1.10) | 0.59 (0.34, 1.02) |
| Wood | 5,604 | 40 | 34 | 5 | 1.07 (0.77, 1.48) | 1.2 (0.84, 1.70) | 0.64 (0.26, 1.57) |
| Other | 5,439 | 36 | 27 | 8 | 0.85 (0.60, 1.23) | 0.86 (0.57, 1.29) | 0.88 (0.41, 1.89) |

¹ adjusted for age, race, education, income, marital status, parity, use of hormonal birth control, use of postmenopausal hormones, age at menopause and menopausal status and BMI

* p-value < 0.05

Table S4. Indoor wood-burning stove/fireplace use and breast cancer incidence by family history of breast cancer, NIEHS Sister Study.¹

| | 1 first degree relative with breast cancer | | ≥2 first degree relatives with breast cancer | |
|--|---|--------------------------------|---|--------------------------------|
| | N cases | HR (95% CI)² | N cases | HR (95% CI)² |
| Indoor wood- burning stove/fireplace | | | | |
| No stove/ fireplace | 492 | 1 | 262 | 1 |
| Yes | 956 | 1.08 (0.96, 1.22) | 544 | 1.16 (0.99, 1.36) |

¹p for interaction=0.8

² adjusted for age, race, education, income, marital status, parity, use of hormonal birth control, use of postmenopausal hormones, age at menopause and menopausal status and BMI

* p-value < 0.05

Table S5. Indoor wood-burning stove/fireplace use and breast cancer incidence by smoking history, NIEHS Sister Study.¹

| | Never smoker | | Ever Smoker | |
|-------------------------------------|--------------|--------------------------|-------------|--------------------------|
| | N cases | HR (95% CI) ² | N cases | HR (95% CI) ² |
| Indoor wood-burning stove/fireplace | | | | |
| No stove/fireplace | 378 | 1 | 376 | 1 |
| Yes | 829 | 1.15 (1.00, 1.31)* | 671 | 1.08 (0.94, 1.24) |

¹p for interaction=0.3

² adjusted for age, race, education, income, marital status, parity, use of hormonal birth control, use of postmenopausal hormones, age at menopause and menopausal status and BMI

* p-value < 0.05

Table S6. Indoor wood-burning stove/fireplace use and breast cancer incidence by educational attainment, NIEHS Sister Study.¹

| | ≤ High school graduate | | Some college | | 4-year college degree | | Graduate degree | |
|-------------------------------------|------------------------|-------------------|--------------|-------------------|-----------------------|-------------------|-----------------|-------------------|
| | N cases | HR (95% CI) | N cases | HR (95% CI) | N cases | HR (95% CI) | N cases | HR (95%CI) |
| Indoor wood-burning stove/fireplace | | | | | | | | |
| No stove/fireplace | 129 | 1 | 269 | 1 | 191 | 1 | 165 | 1 |
| Yes | 179 | 1.17 (0.91, 1.50) | 443 | 1.13 (0.96, 1.33) | 447 | 1.08 (0.90, 1.30) | 430 | 1.09 (0.90, 1.32) |

¹p for interaction=0.5